

WE CLAIM:

1. A disk drive comprising:
 - a disk drive base;
 - a spindle motor hub rotatably coupled to the disk drive base;
 - a disk disposed about the hub and having a disk surface;
 - a disk clamp attached to the hub in mechanical communication with the disk surface for applying a clamping force to the disk; and
 - a disk clamp damping member disposed adjacent and in mechanical communication with the disk clamp and the disk surface for damping movement of the disk relative to the hub.
2. The disk drive of Claim 1 wherein the disk clamp includes:
 - an inner annular surface disposed adjacent the hub;
 - an outer annular surface disposed concentrically about the inner annular surface; and
 - a disk clamp land portion disposed between the inner and outer annular surfaces and extending from the inner and outer annular surfaces to adjacent the disk surface for applying a clamping force to the disk.
3. The disk drive of Claim 2 wherein the disk clamp damping member extends between the outer annular surface of the disk clamp and the disk surface adjacent the disk clamp land portion.
4. The disk drive of Claim 2 wherein the disk clamp damping member extends between the inner annular surface of the disk clamp and the disk surface adjacent the disk clamp land portion.
5. The disk drive of Claim 4 wherein the disk clamp damping member extends between the outer annular surface of the disk clamp and the disk surface adjacent the disk clamp land portion.
6. The disk drive of Claim 2 wherein the disk clamp land portion is positioned upon the disk surface.

1 7. The disk drive of Claim 2 wherein the inner and outer annular surfaces are off-set
2 differently from the disk clamp land portion.

1 8. The disk drive of Claim 2 further includes an annular disk clamp shim, the disk clamp shim
2 is disposed between the disk clamp damping member and the disk surface.

1 9. The disk drive of Claim 1 wherein the disk clamp includes:
2 an inner annular surface disposed adjacent the hub, the disk clamp damping member
3 extends between the inner annular surface and the disk surface; and
4 a disk clamp land portion disposed concentrically about the inner annular surface
5 and extending from the inner annular surface to adjacent the disk surface for applying a
6 clamping force to the disk.

1 10. The disk drive of Claim 9 wherein the disk clamp includes an inner clamp member and an
2 outer clamp member disposed concentrically about the inner clamp member, the disk clamp
3 damping member includes a first section and a second section, the first section extends between the
4 inner annular surface and the disk surface, the second section extends between the inner clamp
5 member and the outer clamp member.

1 11. The disk drive of Claim 1 wherein the disk clamp includes:
2 a disk clamp land portion disposed adjacent the hub and adjacent the disk surface
3 for applying a clamping force to the disk; and
4 an outer annular surface disposed concentrically about the disk clamp land portion,
5 the disk clamp land portion extends from the outer annular surface to adjacent the disk
6 surface, the disk clamp damping member extends between the outer annular surface and the
7 disk surface.

1 12. The disk drive of Claim 1 wherein the disk clamp damping member is formed of a
2 viscoelastic material.

1 13. A disk drive comprising:

2 a disk drive base;

3 a spindle motor hub rotatably coupled to the disk drive base;

4 a disk disposed about the hub and having a disk surface;

5 an annular disk spacer disposed about the hub in mechanical communication with
6 the disk surface; and

7 a disk spacer damping member disposed adjacent and in mechanical communication
8 with the disk spacer and the disk surface for damping movement of the disk relative to the
9 hub.

1 14. The disk drive of Claim 13 wherein the disk spacer includes:

2 a first inner annular surface disposed adjacent the hub;

3 a first outer annular surface disposed concentrically about the first inner annular
4 surface; and

5 a first spacer land portion disposed between the first inner annular surface and the
6 first outer annular surface and extending from the first inner annular surface and the first
7 outer annular surface to adjacent the disk surface.

1 15. The disk drive of Claim 14 wherein the disk spacer damping member extends between the
2 first outer annular surface of the disk spacer and the disk surface adjacent the first spacer land
3 portion.

1 16. The disk drive of Claim 14 wherein the disk spacer damping member extends between the
2 first inner annular surface of the disk spacer and the disk surface adjacent the first spacer land
3 portion.

1 17. The disk drive of Claim 16 wherein the disk spacer damping member extends between the
2 first outer annular surface of the disk spacer and the disk surface adjacent the first spacer land
3 portion.

1 18. The disk drive of Claim 14 wherein the first disk spacer land portion is positioned upon the
2 disk surface.

1 19. The disk drive of Claim 14 wherein the first inner annular surface and the first outer annular
2 surface are off-set differently from the first disk spacer land portion.

1 20. The disk drive of Claim 14 further includes a first annular disk spacer shim, the first annular
2 disk spacer shim is disposed between the disk spacer damping member and the disk surface.

1 21. The disk drive of Claim 14 further includes a second disk disposed about the hub and
2 having disk surface and wherein the disk spacer includes:

3 a second inner annular surface disposed adjacent the hub opposing the first inner
4 annular surface;

5 a second outer annular surface disposed concentrically about the second inner
6 annular surface and opposing the first outer annular surface; and

7 a second spacer land portion disposed between the second inner annular surface and
8 the second outer annular surface and extending opposite the first spacer land portion from
9 the second inner annular surface and the second outer annular surface to adjacent the disk
10 surface of the second disk.

1 22. The disk drive of Claim 21 wherein the disk spacer damping member extends between the
2 second inner annular surface of the disk spacer and the disk surface of the second disk adjacent the
3 second spacer land portion, the disk spacer damping member further extends between the second
4 outer annular surface of the disk spacer and the disk surface of the second disk adjacent the second
5 spacer land portion.

1 23. The disk drive of Claim 13 wherein the disk spacer includes:

2 a first inner annular surface disposed adjacent the hub, the disk spacer damping
3 member extends between the first inner annular surface and the disk surface; and

4 a first disk spacer land portion disposed concentrically about the first inner annular
5 surface and extending from the first inner annular surface to adjacent the disk surface.

1 24. The disk drive of Claim 23 wherein the disk spacer includes an inner spacer member and an
2 outer spacer member disposed concentrically about the inner spacer member, the disk spacer
3 damping member includes a first section and a second section, the first section extends between the
4 first inner annular surface and the disk surface, the second section extends between the inner spacer
5 member and the outer spacer member.

1 25. The disk drive of Claim 13 wherein the disk spacer includes:

2 a first disk spacer land portion disposed adjacent the hub and adjacent the disk
3 surface; and

4 a first outer annular surface disposed concentrically about the first disk spacer land
5 portion, the first disk spacer land portion extends from the first outer annular surface to
6 adjacent the disk surface, the disk spacer damping member extends between the first outer
7 annular surface and the disk surface.

1 26. The disk drive of Claim 25 wherein the disk spacer includes:

2 a first outer disk spacer land portion disposed concentrically about the first outer
3 annular surface and the disk spacer damping member and disposed adjacent the disk
4 surface.

1 27. The disk drive of Claim 13 wherein the disk spacer damping member is formed of a
2 viscoelastic material.

- 1 28. A disk drive comprising:
2 a disk drive base;
3 a spindle motor hub rotatably coupled to the disk drive base;
4 a disk disposed about the hub and having a disk surface;
5 a hub flange radially extending from the hub, the hub flange being formed to
6 support the disk at the disk surface; and
7 a hub flange damping member disposed adjacent and in mechanical communication
8 with the hub flange and the disk surface for damping movement of the disk relative to the
9 hub.
- 1 29. The disk drive of Claim 28 wherein the hub flange includes:
2 an inner annular surface disposed adjacent the hub;
3 an outer annular surface disposed concentrically about the inner annular surface; and
4 a hub flange land portion disposed between the inner and outer annular surfaces and
5 extending from the inner and outer annular surfaces to adjacent the disk surface for
6 supporting the disk.
- 1 30. The disk drive of Claim 29 wherein the hub flange damping member extends between the
2 outer annular surface of the hub flange and the disk surface adjacent the hub flange land portion.
- 1 31. The disk drive of Claim 29 wherein the hub flange damping member extends between the
2 inner annular surface of the hub flange and the disk surface adjacent the hub flange land portion.
- 1 32. The disk drive of Claim 31 wherein the hub flange damping member extends between the
2 outer annular surface of the hub flange and the disk surface adjacent the hub flange land portion.
- 1 33. The disk drive of Claim 29 wherein the hub flange land portion is positioned upon the disk
2 surface.

1 34. The disk drive of Claim 29 wherein the inner and outer annular surfaces are off-set
2 differently from the hub flange land portion.

1 35. The disk drive of Claim 29 further includes an annular hub flange shim, the hub flange shim
2 is disposed between the hub flange damping member and the disk surface.

1 36. The disk drive of Claim 28 wherein the hub flange includes:
2 an inner annular surface disposed adjacent the hub, the hub flange damping member
3 extends between the inner annular surface and the disk surface; and
4 a hub flange land portion disposed concentrically about the inner annular surface
5 and extending from the inner annular surface to adjacent the disk surface for supporting the
6 disk.

1 37. The disk drive of Claim 36 wherein the hub flange includes an inner flange member and an
2 outer flange member disposed concentrically about the inner flange member, the hub flange
3 damping member includes a first section and a second section, the first section extends between the
4 inner annular surface and the disk surface, the second section extends between the inner flange
5 member and the outer flange member.

1 38. The disk drive of Claim 28 wherein the hub flange includes:
2 a hub flange land portion disposed adjacent the hub and adjacent the disk surface for
3 supporting the disk; and
4 an outer annular surface disposed concentrically about the hub flange land portion,
5 the hub flange land portion extends from the outer annular surface to adjacent the disk
6 surface, the hub flange damping member extends between the outer annular surface and the
7 disk surface.

1 39. The disk drive of Claim 28 wherein the disk clamp damping member is formed of a
2 viscoelastic material.

1 40. A disk drive comprising:

2 a disk drive base;

3 a spindle motor hub rotatably coupled to the disk drive base;

4 a disk disposed about the hub and having two opposing disk surfaces;

5 a disk clamp attached to the hub, the disk clamp having a disk clamp land formed to
6 engage a disk surface of the disk in mechanical communication for applying a clamping
7 force to the disk;

8 a disk clamp damping member disposed adjacent and in mechanical communication
9 with the disk clamp and a disk surface of the disk for damping movement of the disk
10 relative to the hub;

11 an annular disk spacer disposed about the hub, the disk spacer having a disk spacer
12 land formed to engage a disk surface of the disk in mechanical communication for
13 supporting the disk;

14 a disk spacer damping member disposed adjacent and in mechanical communication
15 with the disk spacer and a disk surface of the disk for damping movement of the disk
16 relative to the hub;

17 a hub flange radially extending from the hub, the hub flange having a hub flange
18 land portion formed to engage a disk surface of the disk; and

19 a hub flange damping member disposed adjacent and in mechanical communication
20 with the hub flange and a disk surface of the disk for damping movement of the disk
21 relative to the hub.

1 41. The disk drive of Claim 40 wherein the disk clamp land portion, the disk spacer land
2 portion, and the hub flange land portion are aligned.